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Brahmaputra River Waters: Ours is Ours, Yours is Ours Too

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China is the point of origin for over ten major transboundary rivers[1] and shares 110 rivers and lakes which flow into 18 downstream countries.[2] This upper riparian position gives it immense strategic power. It has not entered into a single water sharing agreement.[3] After saturating exploitation of its internal rivers, China has shifted focus towards the transboundary rivers. Despite the environmental backlash faced after the construction of the Three Gorges Dam on the Yellow river, it is going ahead with a new phase of construction of mega-dams.[4] It has planned or constructed dams on the Brahmaputra, the Mekong, the Arun, the Indus, the Sutlej, the Irtysh, the Illy, the Amur, and the Salween.[5]

This issue brief is the second of a three part series which will analyze China's water relations with various Asian sub-regions. Due to the strategic location of the Brahmaputra, any actions and agreements regarding the River take on enormous geo-political significance for India. This issue brief will focus on the Brahmaputra.

Physiography of the Brahmaputra

The Brahmaputra river (2,880 kilometre) originates from Kanglung Kang glacier, near lake Mansarovar, beyond the Himalayan range in the south-western Tibet.[6] Some of the important glaciers which form the northern boundary of the basin are Jima Yangzong, Kailash, Kangchung Kangri, and Nyengchengtanghla.[7] Glacial melt and forms an important source of water for the River, especially in the dry summer months. Known as Tsangpo in Tibet (Yarlung Zangbo by the Chinese), it flows in an eastward direction for almost 1,100 kilometre and is joined by numerous tributaries in this stretch, notable among them the Raka Zangpo, the Nyangchu, and the Lhasa. It takes an abrupt northward turn after Pe in Tibet, forming a series of rapids and taking a number of hairpin bends while crossing over the fault topography between the Gyala Peri (7,294 metre) and the Namcha Barwa (7,782 metre).[8] This section has high hydropower potential. Thereafter, joined by a swift flowing torrential

tributary, Po Tsangpo from the north, the River increases in momentum and turns south and flows through a deep gorge (referred to as the 'Great Bend') in the Nyangtri prefecture, plummeting nearly 2,700 metre.[9] Forming a canyon twice as deep as the Grand Canyon in the US,[10] the hydropower potential in this Region has always enthused engineers. Entering India as the river Dihang in Arunachal Pradesh (660 metre), it flows through the mountains and is joined by multiple fast flowing tributaries including Yamme, Sikku, Sibis, Ringong, and Shimong before entering into the low lying plains of Assam.[11] After it is joined by Lohit and then Dibang, it is finally known as the Brahmaputra. In India, the basin lies in Arunachal Pradesh (41.88 per cent), Assam (36.33 per cent), Nagaland (5.57 per cent), Meghalaya (6.10 per cent), Sikkim (3.75 per cent) and West Bengal (6.47 per cent).[12] Receiving heavy sediment from the northern tributaries including the Subansiri, Kameng, Bhareli, Dhansiri, Manas, Champamati, Saralbhanga, and Sankosh rivers and the southern tributaries Burhi Dihing, the Disang, the Dikhu, and the Kopili; the Brahmaputra forms braided channels across the low-lying Assam for nearly 700 kilometre. The Brahmaputra basin lies in a high seismic zone. After turning south around the Garo hills, the River enters Bangladesh where it is known as Jamuna. A significant right bank tributary, Teesta joins it. It finally merges with the rivers Meghna and Ganga to form the largest delta in the world.[13]

Dependence on the Brahmaputra

The annual average runoff flowing from China to India is 348.020 kilometre^3/year, accounting for almost half the total outflow from the nation.[14] Out of this, the Brahmaputra alone accounts for 165.400 kilometre^3/year, the Indus and its tributaries accounting for the balance.[15] The average flow of the Brahmaputra from Bhutan to India is 78 kilometre^3/ year while it is 537.240 kilometre^3/year from India to Bangladesh.[16] The total annual Ganga-Brahmaputra-Meghna river basin inflow into Bangladesh from India of 1,110.6 kilometre^3/year.[17]

The Tibetan plateau and higher reaches of the Himalayan mountain ranges mainly places above 3000-metre altitude, receive snowfall from the Siberian anti-cyclones during winter months from December to February. The south-eastern part of the Tibetan plateau receives some amount of monsoon rainfall in the month of July and August. The amount of rainfall decreases gradually towards western and central part of the plateau.[18] The number of rainy days in the Tibetan plateau is less, although it experiences light drizzle accompanied by snowfall in some of the days during winter months[19] The number of rainy days at Lhasa is 48 annually.[20] Snow is also a significant part of precipitation in the higher reaches of the basin. The winter precipitation that occurs in the form of snow in hilly areas accumulates until summer.[21]

Despite abundant rainfall and high average water flow in the Brahmaputra, the basin regions in both India and Bangladesh have relatively low potential surface water, which is calculated as the natural runoff of a river. The primary cause is that both regions receive about 80 per cent of the annual rainfall between June and October.[22] On average, 1121.6 kilometre^3/year of water crosses the borders of Bangladesh annually, of which 85 per cent between June and October.[23] In Bangladesh, the manageable surface water resources are considered to be 80 per cent of the dependable flow in March.[24] Therefore, the snowmelt from the Tibetan glaciers which feeds the Brahmaputra in the dry season is crucial to the lower riparian nations and any fluctuations in this flow leaves them vulnerable.

Water withdrawal in China for the entire Ganga Brahmaputra basin in China is around 0.6 kilometre^3, of which 67 per cent (0.4 kilometre^3) for agriculture.[25] The Ganga river basin occupies 33,500 kilometre^2 while the Brahmaputra river basin occupies 2,70,900 kilometre^2.[26] Proportionately, the average water withdrawal in the Ganga basin is around 0.06 kilometre^3 and in the Brahmaputra sub-basin is around 0.54 kilometre^3. The figure for the Brahmaputra basin is likely to be on the conservative side since the region occupied by the Ganga basin is sparsely populated whereas the Brahmaputra

basin falls in the relatively densely populated area, with major Tibetan cities like Lhasa, Shigatse, and Nyingtri dotting it. The water withdrawal in Bhutan, which falls entirely in the Brahmaputra basin, is 0.338 kilometre^3.[27] The potential utilisable water resources in the Brahmaputra basin in India are 50 kilometre^3 and water withdrawal in the Indian part of the basin is 9.9 kilometre^3, 81 per cent of which is used for irrigation.[28] In Bangladesh, in 2008 total water withdrawal within the Ganga-Brahmaputra-Meghna river basin was estimated at about 35.0 kilometre^3, of which 88 per cent (30.7 kilometre^3) was for agriculture, 10 per cent for municipalities, and 2 per cent for industries.[29] The rivers Ganga and Brahmaputra merge in Bangladesh, and the Brahmaputra sub-basin becomes harder to demarcate.

In terms of area, around 50 per cent of the Brahmaputra basin lies in China, 36 per cent lies in India, 7 per cent lies in Bhutan, and 7 per cent lies in Bangladesh.[30] The dependence on the region is inversely proportional–of the 83 million people in the Brahmaputra basin[31]; the population density is 6 persons/kilometre^2 in Tibet, 26 persons/kilometre^2 in Bhutan, 143 persons/kilometre^2 in India and about 828 persons/kilometre^2 in Bangladesh.[32]

The Brahmaputra basin, as a whole, has a forest cover of about 14.5 per cent, grasslands occupy about 44 per cent, agricultural lands about 14 per cent, cropland/ natural vegetation mosaic 12.8 per cent, barren/sparsely vegetated land 2.5 per cent, water bodies 1.8 per cent, snow and ice 11 per cent, urban land 0.02 per cent and permanent wetlands 0.05 per cent.[33] The ancient Brahmaputra is the lifeline of the north-eastern region. It is used for agriculture, fisheries, livelihood, energy needs, and transportation by people throughout its long journey. The River from Dhola to Sadiya is designated as a national waterway in India. Four trans-boundary inland water routes exist between Bangladesh and India on the Brahmaputra already and 16 new routes have been announced for the Ganga-Brahmaputra basin.[34] The River sustains wetlands and forests crucial to the maintenance of the ecosystem; the basin includes the Eastern Himalayas which has been recognised as a global biodiversity hotspot, the Kaziranga, the Sundarbans, and the Khangchendzonga national parks have been recognised as the UNESCO World Heritage sites for their unique natural heritage.[35]

The Himalayas are young, fold mountains; forming a considerable portion of the Brahmaputra basin. They are prone to erosion, resulting in heavy sediment loads, the highest in the world during the monsoons.[36] The entire river flows through a high-risk seismic zone. The entire catchment area is already susceptible to landslides, floods, and erosion. Assam and Bangladesh, the low-lying regions are particularly vulnerable to floods. Assam has experienced floods every monsoon for the past 6 years in a row,[37] causing devastating losses to both human and natural life. During the past nine financial years, since 2008-09, the state's agriculture sector is estimated to have incurred a total loss worth around Rs 61.11 billion due to the damage to crops caused by natural calamities like flood, drought, hailstorm, etc.[38] Floods not only harm the standing crops, their coincidence with the kharif sowing season means that the farmers are unable to sow crops for the next season as well. Floods lead to massive internal displacement, even leading to conflict in some areas of lower Assam where migrants are often considered illegal immigrants from Bangladesh. The dry season brings its own woes. The dried-up river banks collapse, the erosion leading to loss of fertile land.[39]

By Chinese estimates quoted by the Xinhua, since the 1950s, China's glaciers have retreated by about 7,600 square kilometre; around 18 per cent.[40] An average of 247 square kilometre of glacial ice has disappeared every year.[41] Due to climate change, Himalayan glaciers are only expected to decline further. This will increase water availability in the short-term, causing flash floods and meltwater lakes and droughts in the long-term.

Dams and Diversion

The Brahmaputra is one of the least dammed rivers in the world although recent developments are fast changing this scenario. Due to the topography and the flow of the River, the upper and middle courses of the River are ideal for hydropower development. China,

India, and Bangladesh face severe problems of water scarcity and rising demand for power generation.[42]

After tapping out the potential of internal rivers, China has turned towards the trans-boundary rivers like Mekong, Salween, and the Brahmaputra to meet its increasing energy demands. The hydropower potential in the Brahmaputra sub-basin in China alone is an astounding 1,14,000 megawatt (MW) of power, 79,000 MW of which is on the main stem itself, according to a 1972 study by the Chinese Academy of Sciences' Institute of Geographic Sciences and Natural Resources Research.[43] Despite denials by the state,[44] China is going ahead with a series of large- and medium-sized dams on the Brahmaputra and its tributaries.

According to the 13th Five Year Plan, China has committed to increasing its hydropower capacity by 60 GW, over 2.5 times the capacity of Three Gorges Dam in the next 5 years.[45] Since the internal rivers like the Yellow and Yangtse and other trans-boundary rivers like the Mekong and Salween have already been tapped for their hydropower potential, most of this is likely to be generated from the relatively untouched the Yarlung Tsangpo. Even the most conservative estimate by scholars is 20 large dams and around the same number of smaller ones on the Brahmaputra and its tributaries to fulfill this goal.[46]

A cascade of five to seven dams is proposed on the main stem of the Brahmaputra, in the Shannan Prefecture of the Tibet Autonomous Region. The Zangmu dam, with a capacity of 510 MW, has been fully operational since 2015. Approved by the State Council's energy plan under the 12th Five Year Plan, construction has started for three more dams on the same stretch, first, 18 kilometre upstream from Zangmu at Dagu (640 MW); the second, 11 kilometre upstream from Zangmu at Jiexu (510-560 MW) and the third, downstream from Zangmu at Jiacha/Gyatsa (320-360 MW).[47] Zhongda and Langzhen are the other two proposed locations in this stretch.[48] Bayu (720 MW) and Daigu are also proposed dam sites in the same region.[49] Some of the other dams on the tributaries of the Yarlung Tsangpo include the completed Pangduo (160 MW) and the Zhikong (100 MW) power stations on the Lhasa river,[50] the under construction Lalho project on the Xiabuxu river (42 MW)[51] and the proposed Zhongyu project (800 MW) on the Yivong river.[52]

The biggest concern for lower riparian nations are the potential dams being considered at the Great Bend, likely to be constructed at Metog (38 GW) and Daduqia (43.8 GW).[53] With an installed capacity more than one and a half times the current largest dam, Three Gorges Dam (22.5 GW), the construction of even one of these has the potential to permanently disrupt the ecology of the River. Metog is a mere 30 kilometre away from the Indian border.[54]

Apart from these cascades of dams, there has been speculation about water diversion from the Brahmaputra under the Western Route of the South to North Water Transfer Project. One of the strongest supporters of this possibility is the strategist, Brahma Chellaney. He relies on the use of the phrase *xibu da kaifa* which roughly translates as the Great Western Extraction (the benign version more popular in western circles is 'Great Western Opening Up') unveiled by the former President Jiang Zemin for development plans in the Region to understand Chinese intent for the region. He cites the idea of rerouting waters promoted by the hydrologist Guo Kai, the popularisation of the idea through the 1980s to the extent that a preparatory committee was set-up and the plan gained widespread approval.[55] *Tibet's Water will Save China* by Li Ling, a retired government official in 2005, had government sponsored distribution (further proof of Chinese plans).[56] Given the controversial nature of the project itself and the potential international outcry, there has been almost no reference to the plan from government sources. This follows the usual Chinese pattern of testing waters for an idea using a source that allows them plausible deniability. If implemented, the Western route including waters from the Yarlung Tsangpo could carry 200 BCM of water, almost five times more from both the central and the eastern route combined. This would be over twelve times the amount currently proposed for the Western route. The State Grid Corporation of China's map for

2020 also shows the Great Bend area connected to the rest of the country's power supply.[57] The development of roads and railways in the Region will facilitate the movement of heavy construction equipment.

The other camp of scholars believes that the water diversion proposal has too many drawbacks.[58] None of them dispute that it has been considered at the highest levels, but the lack of economic viability and engineering difficulties are the reasons they cite for their belief that the plan might never be implemented. Further, engineering difficulties include construction of tunnels and aquifers at high altitudes, high seismic activity in the Region, and transferring water from a region covered with snow for 5 months a year. The transfer could also permanently change the ecology of the source and the route.

The eastern and central routes of the North-South diversion project are already operational. The environmental destruction caused and the harm caused to its own citizens by these routes have been disregarded by the Chinese central government. It is reasonable to believe that the potential environmental devastation of Tibet and the downstream nations will not be the factor for China when considering the Western route which can dramatically alter water availability in the parched northern provinces. It will be the economic and not ethical hurdles which halt this transfer. The cost of constructing and maintaining canals across the length of the country is so high that the water eventually supplied would need to be priced way above the reach of the average consumer. Estimates for the more moderate Western transfer route alone range between 3.2 and 4.8 Yuan/^{m3} in many cities and as high as 7 Yuan/^{m3} in Beijing. Total project expenses, which were initially projected at US$ 60 000 million for the plan with the limited Western Route currently made public, have also been increasing. The Project faces a number of logistical challenges, including the need to clean water bodies at intersections through which the canals will pass; which will amount to 37 per cent of the total investment.[59] However, the high demand for clean water from the more industrialised and heavily populated northern provinces, which will be required to maintain the current growth rate is the factor that could tip the scales for diversion.

The hydropower potential of the basin in India is 66,065 MW,[60] of which 50,000 MW lies in Arunachal Pradesh.[61] It is interesting to note that China's claims over Arunachal Pradesh got more vociferous after 2006, coinciding with the time it started building dams in Tibet.[62] The total capacity of the dams in India is 11.33 per cent of the assessed potential.[63]

Impact

Water diversion plans or mega-dams, each have the capacity to adversely impact the navigability of the Brahmaputra in the lower reaches individually. The combined impact of such developments will change the course and pattern of water flow of the River, permanently altering the unique ecology of the Tibetan plateau. The dams block silt carried to the lower riparian nations. This annual pulse is critical for maintaining the fertility of the soil and reducing salinity in coastal areas.[64] Dams also block the free flow of a river, impacting the migration patterns of fish, an important source of protein for a large number of rural poor in the Region. Reduced water flows in the lean season can hamper navigation, bringing life to a standstill in the lower riparian nations.

China relies on incomplete information to support its arguments for dams. For instance, the Chinese Foreign Ministry has stated that: "The reservoir capacity of the project is less than 0.02 per cent of the average annual runoff of the Yarlung Zangbo-Brahmaputra. It cannot have an adverse impact on the downstream",[65] in response to India's concerns over the dam over Xiaburi river.[66] This argument has been bought by the international and even the Indian audience who point out the percentages that the Brahmaputra receives from rainfall.[67] Such arguments are erroneous because they completely ignore two important facets; first, relying on the impact on water flow by a single dam overlooks the cumulative impact of the series of dams planned on the Brahmaputra; and second, it fails to recognise the

importance of dry season flows to the lower riparian nations. The reservoirs for the dams over the Yarlung Tsangpo and its tributaries are likely to reduce dry season flows while increasing water released in the wet season; increasing the risk of both droughts and floods in the lower riparian nations.

China has justified run of the river dams, ignoring their impact on dry season flows, which is the reason they are opposed by environmentalists and scholars.[68] India also has a large number of run of the river planned on the Brahmaputra, but they are located on rivers swollen with rain water and can escape the harshest criticism of negatively impacting dry season flows for lower riparian nations.

The Great Bend is located close to the seismic fault line where the Indian plate collides with the Eurasian plate. Pressure caused by the reservoirs for the great dams increases the risk of earthquakes in the Region, the effects of which could be far-reaching and devastating in an unstable mountainous region. This has already been witnessed in other regions of China. The epicentre of the deadly 2008 Sichuan earthquake was located 5 kilometre from the Zipingpu hydropower dam.[69] The dams over the Yarlung Tsangpo are touted as a flood control measure by China but by greatly increasing the risk of earthquakes and earthquake triggered floods and landslides, it is jeopardising the inhabitants of the basin. Further, even accidental flows increase the possibility of disasters in the region. In 2000, 26 people drowned when the level of Siang rose suddenly.[70]

China on Tenuous Legal Ground

The user right principle has been broadened beyond consumptive use alone. Ecological uses are increasingly recognised along with consumptive uses. For instance, this has been recognised by the South African Development Community in the Protocol of Shared Watercourses signed by 11 countries in Africa.[71] This Agreement goes beyond core human consumption requirements and recognises 'those non-human consumption requirements that a failure to meet would cause prohibitively high social, economic or national security costs'.[72] The Murray Darling Basin Agreement between the various riparian states in Australia will, among other things, seek to improve the environmental health of all Ramsar and other key environmental sites in the Basin and secure important environmental outcomes, such as increasing environmental flows, healthier wetlands, and protection of floodplain areas and River Red Gums.[73] Further, India has the right of easement of the waterways it has been using in the north-east and any reduction of lean season flows which can have a detrimental impact on this right and will be considered a violation of the customary law.

Further, water rights under the common law have also evolved beyond 'priority user' rights to recognise 'equitable riparian rights'.[74] Further balancing of these theories led to the evolution of the theory of 'reasonable use' by all riparian partners, including concepts like equitable sharing in case of droughts instead of blindly relying on 'prior use'.[75] Broadening the scope from beneficial use alone, this has mitigated the harsh impact of the prior use doctrine alone. This has been found increasing acceptance across the world like eastern states in the United States, principles are being relied upon by the South African Development Community in the Protocol of Shared Watercourses.[76] Certain types of uses have been recognised as 'per se unreasonable' under the common law, of which the most relevant one in the Indian context is any use which takes the water out of the river basin or off the 'riparian tenement'.[77]

The UN Watercourses Convention 1997 aims to promote 'equitable and sustainable management of Transboundary Rivers and lakes around the world',[78] providing a legal framework for the non-navigable uses of watercourses. The Treaty has provisions like regular sharing of hydrological data, obligation to not cause significant harm to other nations among others.[79] Even though China is not a signatory to the Watercourses Convention[80] but the Treaty is a formalisation of existing customary law. Therefore,

it will be applicable to non-signatories like China as well.

Relying on these principles, India has a right to the water of the Brahmaputra which sustains ecology in the region. Any hindrance to navigation, the primary mode of transportation in the flood ridden region with shifting river beds which make road construction difficult can be considered prohibitively economically harmful to the interest of the region. This right extends beyond the water withdrawn for consumptive purposes alone and ensures a broader, more equitable sharing of river waters. Any diversion of the water away from the Yarlung Tsangpo basin will be strictly against these established principles of reasonable use and equitable use.

Way Forward

Diversion and further construction of dams by China will have disastrous consequences for the lower riparian nations. The potential ramifications on China's image as a benevolent neighbour, a responsible world leader will also stand thwarted, harming its long-term interests. China should increase investment in desalination water purification technology to meet future needs in the northern region of the country. This need is reducing further due to the slower population growth and the shift to cleaner technology and China should utilise this opportunity to mitigate the damage to its own territory and the lower riparian nations.

India should take immediate action regarding the Brahmaputra. The Brahmaputra is critical to India for a variety of reasons; first, the dependence on the River in the region is all encompassing, from irrigation to transportation; and second, India's major concern in the Region is safeguarding its territorial integrity. It needs to accelerate its development plans in the Region while ensuring that none of them impinge on the Bangladesh's rights. It should focus on setting-up multiple smaller dams across its tributaries in India bolster consumptive user rights in case of a dispute and ensure better water management and flood control in the vulnerable north-eastern region of the country. India should also increase infrastructure and military presence near the border to strengthen its claims over the territory. Indian concern about the potential damming and diversion of the river before it reaches India is justified and India should raise global awareness about the potential ecological and human disaster. Strong international mobilisation against the cause can be used to expose its true colours. Finally, due to China's lack of participation in international forums, a multilateral forum must be considered. A grouping of all four nations is ideal even though progress is bound to be limited.

China has attempted to popularise the perception that the not only is China a cooperative upper riparian nation, but the Mekong basin model has been successful enough to replicate in the Brahmaputra basin.[81] As discussed in the first part of this series[82], the Lancang Mekong cooperation group has been created by China to further its economic hold over the Region[83] and China continues to play only a marginal role in the Mekong Agreement. It has created a 'false impression of cooperative riparian relations'[84] using tools like bilateral agreements regarding the selling of hydrological data, commercial cooperation or joint research initiatives while rejecting the core concept of water sharing.[85]

This is true of its current position regarding the Brahmaputra as well. After a decade of negotiations, China and India entered into a memorandum of understanding (MoU) regarding sharing of hydrological data,[86] helpful for flood control.[87] However, this data is available only from 15 May to 15 October, leaving the lower riparian nations on a weak footing when it comes to handling crucial dry season flows.[88] The addition of 15 days of May was considered a major step forward during dialogues,[89] giving an indication of the long road ahead for a negotiated peace regarding Brahmaputra waters. Despite China's best whitewashing attempts, the reality is that Chinese promises to ensure 'adequate' safeguards to protect the rights of lower riparian nations are empty without any external authority to determine what is adequate.

The mitigating factors which force China to take a softer stance regarding the Mekong are missing for

South Asia. Unlike its South-East Asian neighbours who are critical to the success of One Belt One Road, China has little incentive to maintain cordial relations with India or Bhutan, two nations opposed to its flagship project. Further, China does not have unsettled land borders with any nations in South-East Asia. A hydropower rich part of the trans-boundary river flows through Arunachal Pradesh, a region that China claims as part of its territory. Any negotiations regarding the Brahmaputra will get tied to the larger sovereignty issue regarding Arunachal Pradesh, making any substantial agreement unlikely. The South African nations model and the Murray Darling Basin model are both working successfully and have lessons to offer. India's largesse as an upper riparian towards Pakistan regarding the Indus River Waters has been a success story. It should be cited as the positive impact that cooperative riparian relations can make on overall bilateral relations and in ensuing stability in the Region. Even if a grouping of all the nations concerned fails; a grouping among Bhutan, India, and Bangladesh using its combined leverage to negotiate with China will be better than the current vacuum that policy regarding the Brahmaputra is haphazardly created in. Six upper riparian nations in the Nile Basin used this tactic to gain greater access to the waters of the Nile, which had been granted to Egypt and Sudan under colonial treaties.[90]

Ultimately, it is in the South Asian region's best interests to have cooperative riparian neighbours. An agreement at this stage can mitigate future conflict which could have a huge burden, both economic and social on all participants, which either of the nations can ill afford.

Notes

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